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ABSTRACT

This study examined the determinants of school enrollment in Ghana, considering historical and social information to formulate an econometric model of school enrollment patterns for households. Data came from a 1989 survey of households in Ghana. The survey collected basic information about community characteristics, health and school facilities, and living conditions. This 1989 survey was the second in a series of surveys in Ghana. It included a sample of children age 6-20 years. Analysis of the data indicated that gender of the child and school attendance of the child's mother were the most significant predictors of school enrollment status. Boys were more likely to attend schools than girls, and girls were more likely to drop out of school than boys. Uneducated mothers were three times more likely to have children who did not attend school. Girls of mothers who did not attend school were 1.8 times more likely to drop out and half as likely to attend school than girls of mothers who attended school. The mean cost of schooling had no measurable effect on school enrollment status. (Contains 15 references and 4 tables.) (SM)

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The Determinants of Girls' Educational Enrollment in Ghana

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THE DETERMINANTS OF GIRLS' EDUCATIONAL ENROLLMENT IN GHANA*

I. Introduction

The determinants of school enrollment in Ghana are an important part of policy decisions in the ministry of education, the budgetary process, and for non-governmental organizations attempting to effect change in the lives of the Ghanaian people. In particular, female school attendance has become a topic of increasing interest as the importance of girls' education to a wide spectrum of socio-economic outcomes has become apparent. The material which follows presents a picture of the determinants of school enrollment in Ghana. The study considers the historical and social information presented in this section to formulate an econometric model of schooling enrollment patterns for households.

Section II provides a literature review of studies done on educational enrollment patterns in Africa and other developing countries. The studies provide a useful tool for constructing variables and selecting appropriate questions about the descriptive statistics. Section III describes the data set and gives a descriptive analysis of the demographics of the data. It goes on to present the hypotheses and suggest expected results based on the construction of the linear regression model, and provides the reader with background information about how the logistic regression is constructed, and how it measures the impacts of the explanatory variables. Section IV discusses models that were considered, and specifies the logistic model used to map

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* This paper is based on research contained in the first author's Master's thesis, "The Determinants of Educational Enrollment in Ghana: A Gendered Perspective," Cornell University, May 2001. The authors are grateful to Professor William Tomek for advice and comments on this work.

school enrollment patterns in Ghana. Section V presents the results of the model for each of the three dependent variables. Section VI concludes the study and presents interpretation and analysis of the results. It also considers the possible policy implications of the results, and gives suggestions for future studies.

History of Education in Ghana

The British established the first western style education of Ghanaians. The colonial schools taught English and basic mathematics skills to train Africans for work in the British warehouses (Awoonor pp. 175). Only four percent of the population received an education in 1948. By 1960 school enrollment had reached 21%, with the majority of growth occurring in urban areas (Awoonor p. 176). In the 10-14 year old group, 43% of children were in school. In 1961, Nkrumah established universal free and "compulsory" schooling (Shillington p. 6) and by 1970, 63% of 6-14 year olds were receiving an education including 67% of all boys and 58% of all girls (Rimmer 1992). In 1987, the numbers had not changed for younger children, since according to the Ghana Living Standards Survey from 1987/88, 67% of boys and 59% of girls in the 6-11 age range were enrolled in school.

In Brown and Kerr's study of the Gender Dimensions of Economic Reform, the authors found that 50% of teachers were untrained, and there were no textbooks for the majority of children (Brown 1997) and that literacy and enrollment were declining. In 1987 the government instituted a reform program for the education system whose goals were to increase enrollment at a faster rate than population growth, increase government spending on education, and receive food aid for schools from the World Bank program. The Ghanaian government would also implement the

following user fees: tuition payments at primary and junior secondary levels, textbooks fees for grades 3-10, and full cost recovery for meals at secondary schools. The fees were also increased by unofficial user fees and tuition payments charged by local schools, teachers and/or administrators (Brown 1997).

II. Previous Studies

Studies linking educational enrollment data and household data have been done in Africa, although they have not linked the implementation of school fees with educational enrollment. Many have been done linking enrollment rates with fertility or family size.

Utilizing a rural income distribution survey in Botswana from 1975, Chernichovsky (1985) analyzed the impact of the number of school age children in the household on the enrollment rates of children and discovered that when there were more children in a household, school attendance went up. He determined from this that with more children available in a household, only some are needed for farm work. However, he did find that the presence of a baby in the home meant that girls were less likely to be enrolled in school, as girls were required to take care of the infant. Chernichovsky found that location had a small positive effect on school enrollment, but had no effect on what level of school a child obtained. He concluded that household factors were more important than community factors. The Botswana study also indicated that female heads of household were more likely to send children to school. This was particular to rural Botswana because females in this area receive

more education than men do. As a result they value education more than their counterparts.

Gomes (1984) looked at small data sets in Kenya to determine the impact of birth order and family size on education, using a household production model to evaluate the determinants of level of education completed. The dependent variable measured completed education, and the independent variables were a vector of demographic variables describing age, tribe, family size, and birth order, and a vector of socioeconomic variables including parental occupation and education. Gomes used a stepwise regression to eliminate those variables that were statistically insignificant. Her results indicated that families who have more than seven children are advantaged in educational enrollment due to older siblings paying for the education of younger siblings. Small families tend to favor first born children in educational investment. She also found that mother's education level had a positive effect on children's education level. This effect was larger in absolute value than the effect of father's education. She found that being male had a positive effect on years of schooling as did size of landholding. Her results highlight an interesting correlation between mother's education and children's education level.

Lloyd and Gage-Brandon (1992) used the 1987 Ghana Living Measurements Standards Survey to explore the relationship between education and family size. The analysis investigated relationships between three dependent variables: ever enrolled in school, drop out if ever enrolled, and level attained if ever enrolled. The independent variables were broken down into four groups: Child Characteristics, Reference Parent Characteristics, Household Characteristics, and Community Characteristics. The child characteristics included child's age in years, child's age squared, number of younger

"same parent" siblings, and number of older "same parent" siblings. The Reference Parent Characteristics include reference parent's marital status, reference parent is the head of household, reference parent's educational level, reference parent's occupation, and reference parent's age. The household characteristics included an income measure, which is based on reported levels of consumption by household, presence of mother in household, and presence of father in household. The community characteristics include urban or rural, number of students per teacher, percentage of teachers trained, and the proportion of children in each age/sex group currently enrolled in reference parent's cluster. The effect of the parent's education on the child was only measured for the reference parent. Each child was either in a mother based or a father based group. For the level of education attained by girl children, the mother's education level had a positive significant effect. The effect was higher for girls than for boys in all age groups. The conclusions reached by Lloyd and Gage-Brandon's analysis indicate that high fertility rates have a negative impact on school enrollment of girls. Mothers depend on girl children to take care of younger siblings while they are raising a family. Furthermore, mothers expect their sons to take care of them in their old age, and therefore are interested in their education leading to a higher income. The study implies that if social prejudices were lessened, the subsequent decrease in fertility could bring about greater participation of girls in school.

Using cross-national data from 1975-1987, Buchman (1996) used a panel regression analysis to look at the determinants of female secondary school enrollment. The seventeen countries included in her study were Argentina, Bangladesh, Brazil, Chile, Columbia, Cote D'Ivoire, Egypt, Indonesia, Jamaica, Mexico, Nigeria, Peru,

Philippines, Sudan, Thailand, Tanzania, and Yugoslavia. Buchman's model consisted of four dependent variables, one of which measured the percentage of all secondary school age girls enrolled in school. The independent variables used a number of national indicators, including an index of structural adjustment to account for the number of debt restructurings and number of debt renegotiations, number of times a country has utilized the IMF fund facility, the total loans a country received as a percentage of its allotted quota in 1985, debt dependence, foreign investment dependence, economic development, urbanization, domestic investment, female industrial employment, the infant mortality rate, and immunization. The results of Buchman's study are interesting in that the study showed that of the independent variables in the model, only economic development and structural adjustment have an effect on total secondary school enrollment. Structural adjustment has a strong negative effect on female secondary school enrollment, and economic development has a strong positive effect on female secondary school enrollment.

Tansel's study, "Schooling Attainment, Parental Education, and Gender in Cote D'Ivoire and Ghana," assesses the importance of parent's education in the schooling attainment of their children. Tansel looks at the gender differences in parental influence and also examines how distance to school impacts girls and boys differently. Tansel utilizes the Ghana Living Standards Measurement Survey for 1987-88 and 1988-89 to construct a household production model to demonstrate how a household would maximize a one period utility function; TE= V(W,P,V,C) where TE is a function of the time children spent in school, W is a vector of wages of household members, P is a vector of prices of inputs purchased in the market, V is unearned household income, and C is a set of child or household characteristics. Using a probit

model. Tansel found that the effect of father's education was more significant than mother's education for both girls and boys. Both parents' education was found to have a higher impact on girls' schooling than on boys' schooling. Distance to school was also found to be an important factor in school attendance, and had a greater effect on girls. Household income, computed as per adult total expenditure, had a positive, significant effect on schooling.

The studies reviewed are consistent in that they look at household or societal characteristics to determine effects on education. From these studies we can conclude that there are many important determinants in school enrollment. Specifically the studies point to the importance of gender, parent's education, family size, age of the child, and structural adjustment packages in place in the country. Economics enters the model partly via the opportunity costs. Children may be withheld from school to tend to younger siblings, to earn wages, to do household chores or farm work. These costs may be as important or more important than the enrollment fees. In effect, it is not what the child must pay that is the problem; it is what they give up in the time involved in schooling.

III. Descriptive Statistics and Methodology

The Data Set

The data used in this analysis are from the Ghana Living Standards Survey sponsored by The World Bank in 1987, 1989, and 1992. The survey included questions about each family member and the situation of the household as a whole.

and gathered individual and household data. A questionnaire was also used for community statistics, and filled out by health and school authorities.

The purpose of the survey is to make available basic information about the living standards in Ghana in order to analyze the changes in living standards over time. The 1987 survey was done on 3,200 households, which were selected to provide a self-weighting sample. Each household was numbered, and each person in the household was numbered. The area of the household was denoted first by cluster number, of which there were approximately 170. Household numbers and person identification numbers were consistent throughout the years and the same households were surveyed in each subsequent study. All answers about households were self-reported by household heads. Community characteristics, including health and school facilities, provided information on a survey basis as well. Reported figures were not from official reports but from a surveyed administrator.

The data used in this study are from the 1989 survey (1992 survey data were not ready for distribution at the time of writing), which was the second in a series of data collections done in Ghana. This survey included 170 clusters, 3,192 households, and 14,924 individuals. In this analysis a subset of the full sample is used. Although the data set included schooling information for every member of the household, only information about 6-20 year olds is included, thus limiting the study to those children that could be enrolled in school if they chose to be. The data set has 6,719 children. Not all questions were answered for every child so percentages are given to describe the children who answered each question. The study gives a picture of what decisions households are making in 1989 about school enrollment.

Descriptive Statistics

The data set consists of a sample of children in Ghana from age six to age twenty. All 6,719 observations reported the age of the child. The data set is fairly evenly distributed, ranging from four percent at age 19 to nine percent at age 6.

A cluster number denotes the location of the household. There were 170 clusters in the data set, each defined as urban or rural. There were 56 urban and 114 rural clusters in the 1989 survey. Of the children in the subset, 71.5% lived in rural areas, and 28.5% lived in urban areas.

In terms of sex, the sample is evenly distributed between females and males. This is an important item to consider since we will be looking at the specific gender effects of school enrollment in Ghana. If gender is not an intervening variable, then the dropout rates and enrollment rates for girls and boys will be fairly even, since the sample is evenly divided between the sexes.

An important determinant of school attendance for a child is the parent's apparent interest or personal investment in formal education. There is a large disparity between father's school attendance and mother's school attendance. Of the children who reported, over half (55%) of fathers attended school while only 32 percent of mothers attended school.

Most Ghanaians, about ninety percent, choose to enroll their children in the public schools. Only ten percent of children surveyed attended private and/or parochial schools.

Each family reported a cost of schooling for those children attending school. Cost of schooling is defined as total cost of tuition, books, transportation, uniforms,

and other miscellaneous fees for each child. Cost of attending school for those not attending is not included in the data set. In order to understand the relationship between school fees and school enrollment, we must know the cost of schooling if the child had attended school. Therefore, we need an average cost of schooling in the area. The mean total cost of schooling can best be calculated from the standpoint of self-reporting by parents because the unofficial fees paid by parents are reflected in their final reported cost. If that number is then averaged over a geographic area, it can be used as the average cost of attending school for those children who are not choosing to attend, i.e., the costs if they had chosen to attend. The average annual school cost in Ghana in 1989 was 4,168 cedis, which is about four percent of the average annual income for households. The range in cost throughout the clusters ran from zero to 25,000 cedis in some areas, and thus the cost of schooling ranged from zero to 25% of income on average. School expenditure was calculated and tested a number of different ways,* but the mean total expenditure method appeared to most accurately reflect the average cost of schooling that a parent had to consider when making enrollment decisions about their child.

The school attendance rates are perhaps the most important information to look at in the data set. The number of school-age children attending school rests around seventy eight percent. Males have a higher attendance rate at over eighty percent, while seventy three percent of the females are attending school presently. There is still a gender disparity in the attendance rates of children in Ghana. While on average 22 percent of all students dropped out of school, males dropped out of school 18 percent of the time, while females dropped out 26 percent of the time. An even larger

* Details available upon request

gender disparity can be found in the group of children that never enrolled in school. Thirty percent of girls never attend school, while only 19 percent of boys never attend school. On average around 25 percent of children in Ghana never enroll in school.

The Model

School attendance can be analyzed using probability measures: the probability of a child dropping out, the probability of a child attending, or never attending school. A logistic regression model can show which variables have a greater likelihood of causing a student to drop out, never attend, or continue to attend school. The three models presented in this paper will address the impacts of age, gender, location, school fees, and mother's school attendance on the school dropout rate; on the lack of school enrollment; and the mother's school attendance on school enrollment.

Mathematically, the logistic regression model provides estimates of the probability of a particular event occurring and in the process identifies the specific variables that are instrumental in determining that event (Pindyck & Rubinfeld). A generalized model can be written as:

$$\text{Prob(event a)} = e^{Z} / (1 + e^{Z})$$

$$\text{Or} \quad \text{Prob (event a)} = 1 \ / \ (1 + e^{-Z})$$

where Z is the linear combination of explanatory variables, X.

$$Z=B_0 +B_1X_1+B_2X_2+\ldots\ldots B_pX_p$$

The probability of the event not occurring is estimated as

$$\textbf{Prob(no event) = 1- Prob (event)}$$

The probability estimates are always between 0 and 1, regardless of the value of z, but the probabilities are not observable. Thus, as noted above, the estimator uses the event (one) and non-event (zero) data to maximize a corresponding likelihood function because of the logistic functional form. Contrary to the linear regression model which minimizes the sum of the squared differences between the actual and predicted values, the logistic regression model maximizes the probability of obtaining the actual observed values (Wright 1995). In other words the parameters are estimated such that the observed sample is the most likely one to have been selected (maximum likelihood).

Mathematically, the logit model is

$$\textbf{Log}\ \frac{\textbf{Prob (Event)}}{\textbf{Prob (No Event)}} = B_0 + B_1X_1 + \ldots\ldots B_pX_p,$$

The coefficients of the independent variables can be interpreted as estimators of the change in the log of the odds ratio associated with a one-unit change in the independent variable. For example, if the parameter estimate for salary is 2, then a one-unit increase in salary will decrease the log of the probability of the event occurring divided by the probability of no event occurring. Because a change in the

log odds is intuitively inaccessible to most readers, results can be presented in several alternative ways. One is to convert the equation into terms of odds by taking the whole equation to the power e. The equation is then:

$$\frac{\text{Prob (Event)}}{\text{Prob (No Event)}} = e^{B_0 + B_1X_1 + \ldots\ldots BpXp} = e^{B_0} e^{B_1X_1} \ldots . e^{BpXp}$$

The odds of an event occurring are more accessible to the reader and easier to compare when discussing the impact of a one-unit change in the independent variable. e raised to the power b_i is the factor by which the odds change when the i^{th} independent variable increases by one unit. If B_i is positive, this factor will be greater than 1, which means the odds are increased. If B_i is negative, the factor will be less than one, which means that the odds are decreased. When B_i is 0, the factor equals one ($e^0 = 1$), which means there is no change in the odds. If the parameter estimate is 1.1, then the exponent estimated is 3.0 ($e^{1.1} = 3$). This factor, which is above one, means that the odds are increased by a factor of 3. If the factor is below one, say at .5 ($e^{-.69} = .5$), then the odds of an event occurring are cut in half. Therefore, we can use the estimated exponents to discuss the impacts of each estimate (Morgan 1988).

IV. Specification of the Model

Preliminary Findings

Preliminary models were tested before deciding on the final model.* The literature review pointed to numerous variables that may influence school enrollment, including age, sex, rural, cost of school, cost of school squared salary, distance to school, private school attendance, parents' education level, and rural location.

Salary was tested in two forms. The first, a report of yearly income based upon self-reported income, was insignificant in all preliminary models. Salary was also computed as a measure of a consumption basket for the household but this was also found to be insignificant. The burden of school fees was computed by taking the mean cost of schooling in the area and dividing it by salary. The mean cost of schooling was also divided by the consumption basket. Both of these variables for burden of schooling were found to be highly insignificant in this and all subsequent formulations where they were tested.

Distance to school was calculated using number of minutes that it takes to travel to school. This variable was also found to be insignificant, as was private school attendance in all three models.

Father's school attendance was also tested on all three levels and found to be highly insignificant in the dropout and attending model. It was significant in the never attended model, but had a very small effect on the odds ratio. Since its inclusion affected neither the odds ratio in the one model where it was significant, nor did it

* Full details available upon request.

have any detectable interactions with other variables, it was dropped from the final model.

The rural/urban classification was also tested as a dummy variable denoting whether the child was located in Accra or outside of Accra. This variable had the same results as the final model's value for urban/rural, with slightly lower absolute values. Because the Rural/Urban classification by cluster more accurately reflects the demographics of Ghana, this measure was used instead of the Accra variable.

Final Model

Dependent Variables:

Three separate logit regressions are used to estimate the determinants of educational enrollment in Ghana. The three binary dependent variables are constructed from the data to obtain three variables, school dropouts (DROP), school attenders (ATEDING), and non-attenders (NEV). All household heads were asked two questions, "Has your child ever attended school or is s/he attending school presently," and "Is your child attending school presently." If they answered no to the first question, then they were assigned a one for never attended school. If they answered yes to the second question, then they were assigned a one for attending school presently. If they answered yes to the first question, and no to the second, then they were assigned a one for dropping out.

The three different dependent variables are reported by the head of the household who would have the most accurate information about their child's school enrollment status. Because our data set reflects school age children, it is most appropriate for us to consider the current enrollment status instead of level of school

completed particularly since the purpose of the study is to determine school enrollment patterns for households deciding on school in 1989. Level of school completed could only be used in looking at school determinants over a long period of time. Because we are trying to capture the impact of school fees implemented in the late 1980's, it is imperative that we look at children that are making enrollment choices in that particular time period.

DROP indicates that a student has dropped out of school. A value of 1 indicates that they dropped out, and a value of zero indicates that they are attending school or have never attended school. Dropouts should be influenced by several factors, most importantly gender. Because of household duties, and gender bias, it is more likely that girls will drop out of school. Furthermore, clusters that have high fees should have higher drop out rates. There were 1,716 observations in the drop out model.

ATEDING accounts for the students that are attending school presently. A 1 indicates that the student is attending school, and a 0 indicates that they dropped out or never attended school. School attenders will more likely be male, and have educated parents. It is also likely that children with lower school fees will be more likely to attend. There were 1,719 observations in the attending model.

NEV accounts for the students that have never attended school. 1 equals never attended, and a 0 indicates that they dropped out or are attending school presently. Those that have never attended school will more likely be female and have uneducated parents. School fees will be high for them (See Table 1 for variable definitions). There were 2,282 observations in the never attended model.

Explanatory Variables:

The explanatory or exogenous variables are constructed or obtained from the data set. The variables include the age of the child (AGEY), rural location (RURAL), sex of the child (FEMALE), mother's school attendance (MNOTATT), interaction between the sex of the child and the mother's school attendance (FEMMNOTATT), and finally a centered mean school expenditure (CMTEXP), and the square of this variable (CMTEXPSQ). This section defines each variable and the equations for the model.

The age in years variable (AGEY) accounts for the age of the children in the data set. The particular sample used includes boys and girls from age 6 to age 20, which is the typical school age in Ghana. As a child gets older it is likely that education will be seen as less important. Specifically, the age variable is used to capture children moving out of schooling as they are needed for farm work, or other paying professions. There is no theoretical reason to believe (nor does the literature review suggest) that age for school children should have a nonlinear effect, so the square of the age variable was not included.

The sex dummy (FEMALE) variable captures the sex of the household member. A zero variable denotes a male and a one denotes a female. The sex of the household member is important to look at because of the possibility of sex discrimination in parents' willingness to pay for educational costs. It also reflects societal expectations of children based upon gender.

RURAL measures the impact of living in a rural area. Each cluster was defined by the surveyors as rural or urban, based upon the demographics of the cluster. In the 1989 data set, there were a total of 170 clusters, with 56 urban clusters and 114

rural clusters. The urban clusters included Accra, Kuasi, Ho, Abosso, and others. The majority of the urban areas represented more than three clusters. Approximately thirty percent of the children lived in a rural area. As noted above, initial regressions were done on the Accra region versus other regions with the same results.

MNOTATT is a dummy variable for mother's school attendance. The survey asked, "Did the mother of (name) attend school." A one indicates that the mother did not attend school. A zero indicates that the mother did attend school. This variable is particularly important in determining the impact of education and social class on children's school enrollment, since the education level of the mother is a factor in the social class of the family as a whole. It is reasonable to assume that a mother who enrolled in school would have that expectation for her children. Conversely, a mother not attending should increase the odds of a child dropping out of school, or not attending school at all.

FEMMNOTATT is an interaction variable between the sex variable (FEMALE) and the mother's school attendance variable (MNOTATT). It is constructed as the product of the female dummy variable and the mother's school attendance dummy variable. If the subject was female (denoted by a one) and the mother had not attended school (denoted by a one) than the FEMMNOTATT equals one. The variable indicates, if significant, that there is an interaction between the gender of the child and the gendered schooling status of their parent. This variable was included because the descriptive statistics indicated that female children of mothers who have not attended school were prevalent among those who had either dropped out of school or not attended school.

Total school expenditures for the students in the sample were computed by finding the mean total expenditure for each cluster. Each cluster is a geographical group and represents regional characteristics. Each household who had a child attending school reported the cost of schooling for their child. As described above, these school expenditures were averaged for those students attending schools in each cluster and the resulting number was then used for all children within the cluster to capture the cost of school in an area for everyone. The mean of each cluster's costs were measured and then assigned based upon cluster association.

This procedure was essential in order to capture the price of school for non-attenders based upon parent reports. Because there are often unofficial fees associated with schooling in Ghana, the reports of schools are not an accurate measure of the true cost of schooling. The costs of schooling were reported by each parent with a child attending school. These parents reported schooling costs in the following categories: contributions to parent associations, uniforms and sports clothes, books and supplies, transportation to school, cafeteria, board and lodging, tuition and registration fees, and other miscellaneous expenses. The average cost of schooling per cluster ranged from zero to 25, 084 cedis. The mean cost of schooling over all clusters is 4,168 cedis. In order to make the mean total expenditures more robust; they were centered by subtracting the average cost of school for all clusters from the average for each. That is, the average cost of schooling (4,168) was subtracted from the cost of schooling for each cluster. This shifted the range to 4,168 to 20, 916. The variable CMTEXP denotes the centered mean average cost of schooling.

The school expenditure variable is squared to give CMTEXPSQ. This variable reflects the hypothesized nonlinear relationship between school expenditures and

school enrollment. At a certain level of income or class, school enrollment is not affected by cost of schooling. The square of the centered mean schooling costs is denoted by CMTEXPSQ.

The data used for each model is bound to the conventions of the logistic regression model. Therefore, every question in the model must be answered to fit an estimate for that child. Any child that has even one missing answer is not used in the model. Thus, although the data set is the same, the exact children in each regression varies slightly, based upon the questions that the parent answered.

Equations

The following equations represent the econometric model of school enrollment determinants for children in Ghana.

School Drop-Outs

Log {Prob (Dropping Out) / Prob (Not Dropping Out)} =

$B_0 + B_1$AGEY $+ B_2$FEMALE $+ B_3$RURAL $+ B_4$MNOTATT $+ B_5$FEMMNOTATT $+$ B_6CMTEXP $+ B_7$CMTEXPSQ

School Attenders

Log {Prob (Attending School) / Prob (Not Attending School)} =

$B_0 + B_1$AGEY $+ B_2$FEMALE $+ B_3$RURAL $+ B_4$MNOTATT $+ B_5$FEMMNOTATT $+$ B_6CMTEXP $+ B_7$CMTEXPSQ

Non- Attenders

Log {Prob (Never Attending School) / Prob (Attending or Dropping Out)} = B_0 + B_1AGEY + B_2FEMALE + B_3RURAL + B_4MNOTATT + B_5FEMMNOTATT + B_6CMTEXP + B_7CMTEXPSQ

V. Empirical Results

The results of the model indicate that the explanatory variables are solid predictors of the determinants of schooling. Although the model failed to show that school fees impact school enrollment, it did indicate that there are some strong determinants for school enrollment. All of the models have statistically significant effects.

Results for the Drop Variable

The DROP variable, a binary dependent variable constructed from yes/no questions asked about 6-20 year olds in the sample and designed to distinguish students who dropped out from those attending and those who never attended, was regressed on a number of independent variables to determine what factors increased the likelihood of a student dropping out of school. These variables included sex, age of respondent, rural or urban, school expenditure, school attendance of the mother, and an interaction term of the sex of the child and the school attendance record of the

mother. The tests of goodness of fit of the model indicate that the model is an overall good predicator of school drop out rates. See Table 2 for results.

By looking at the estimated exponents, one can see that female children are estimated to be 1.53 times more likely to drop out of school than male children are. The initial descriptive statistics indicated that girl enrollment may have been a problem, because of the disproportionate number of girl children that were not attending school, or dropped out of school. This result indicates that gender is in fact a strong determinant of the propensity of a student to drop out.

The age of a child in years was also a significant determinant of school enrollment. With each increasing year, a student is 1.4 times as likely to drop out of school. Because our model included 6 to 20 year olds, we can assume that as children reach their late teens, they are more often needed for paid labor. The age of the child is an important predictor of school enrollment status but not a shocking one.

The location of a student's home is an interesting predictor of dropout status. The data indicates that a child in a rural area is three quarters as likely to drop out of school as a child in an urban area (significant at the three-percent level). This result is inconsistent with the hypothesis that rural children are more likely to be needed for farm work, and hence drop out of school. Because there is a large farm and crop management component to schooling, education may in fact be more valuable to the rural child. Urban children face the pressure of city life, and have opportunities to work in factories or urban businesses, which may be more lucrative than continuing schooling.

For the dropout model, the mother's school attendance was not significant alone. But if one looked at the interaction between mother's school attendance and the

gender of the child, a significant result emerges. The female child who has a mother that has not attended school is 1.87 times as likely to drop out of school. This is particularly interesting because it points out how the social class of a household relates to the importance of education for girl children. This has major implications for programs that consider educating the whole household, and not merely the child.

The mean total cost of schooling and the second power of this variable are statistically significant, but are small in the absolute value of the coefficients. The coefficient of the linear log term is negative, and the quadratic term is positive. When the exponents are estimated in terms of odds, the estimate equals one. The estimated exponents show that with each dollar increase in the cost of schooling, a student is no more likely to drop out of school. These results coincide with preliminary findings that indicated that salary was also not a predictor of school enrollment in Ghana. The social structure of the household and the gender of the child are perhaps the dominant predictors of the propensity of a student to drop out of school. It is also possible that the observed variable is not a good estimate of the actual costs. Also, the dropout variable means that these students did start school.

In conclusion, the determinants of a child dropping out of school are most importantly the sex of the child, and if the child is female, the lack of school attendance by the mother. We cannot say that as school cost increases, children will be more likely to drop out of school.

Results for the Never Attended Variable

The never attended variable (NEV) was regressed on the same independent variables as used in the previous model: the age of the child, the sex of the child, the location of the child's household, the mother's school attendance record, an interaction term between the mother's school attendance record and the sex of the child, and the cost of schooling (See Table 3).

The overall robustness of the model is sound. The likelihood ratio, the Wald statistic, and the Pearson statistic are all significant at the 1- percent level. The predicted values were seventy nine percent concordant with the observed values.

The age of the child in years was significant with a small impact on the never attended variable. As a child's age increased, they were less likely to never attend school. This makes sense because if a child was not going to attend school, then that would not increase as they got older. Traditionally, children who change their decision about schooling will drop out at a later age, rather than start attending school later. Basically this indicates that children who were not enrolled in school at six will still be not enrolled at ten. As their age increases they will not be more likely to never enroll. Although this is a statistically significant effect, the magnitude is small.

The sex variable is statistically significant and a robust indicator of the children who will not attend school. By looking at the estimated exponent (last column of the table), one can see that female children are more than twice as likely to not attend school as their male counterparts.

The mother's school attendance record was also a significant indicator of those who would never attend school. Children of mothers who have not attended school

were **over three times** as likely to not attend school as their counterparts. This estimate was significant at the one- percent level, and shows how important it is for mothers to be educated in order for children to also obtain an education.

The interaction term between females and mother's school attendance record was insignificant for the never attended binary dependent variable. The rural variable was also insignificant for the never attended dependent variable.

As in the case of the dropout dependent variable, the mean total expenditures on schooling are not predictive for the never attended variable. Although the parameter estimates for CMTEXP and CMTEPSQ were significant, they were very small in absolute value and indicated that as average school cost increased, a child was no more likely to not attend school. In conclusion, those most likely to never attend school are females, and children of mothers who have not attended school. Once again, the social class of the family has much to do with the value of education in the family.

Results for the Attending Variable

The attending variable measured the probability of a child attending school and takes the value one if the child is attending school. The independent variables used to predict this outcome are as previously noted and results are shown in Table 4.

The overall robustness of the model was good. The model was eighty four percent concordant, which indicates that 84% of the time, the predicted values matched the observed values. The Wald, Pearson, and Likelihood ratios were all significant at the 1- percent level.

The age of the child was fairly predictive of a child's probability of attending school. As a child grew older with each year, s/he was a little more than half as likely to attend school. This result was significant at the one- percent level, and fairly consistent with our ideas of schooling. As a child gets older, s/he is less likely to continue schooling.

Females were approximately half as likely to attend school as males. This result was significant at the one-percent level, and shows that females are disadvantaged in terms of their ability to attend school. The results from this variable are consistent with the descriptive statistics, which show lower attendance rates for girls than boys.

Those living in a rural location were 1.6 times as likely to attend school. This result was counter to the hypothesis, which proposed that children in rural areas would have a harder time attending school. Preliminary tests on travel distance to school proved insignificant for enrollment statistics. As mentioned before, this propensity for rural children to attend school could be due to the fact that rural children do not have as many options for employment as urban children do. As the school schedule is built around the farm schedule, schooling may be more convenient for rural children. Urban children have the option of factory work and retail work. These income generating ventures appear to be more attractive than school for many children in urban areas.

The mother's school attendance alone was insignificant for those attending school, but when the interaction term between females and mothers school attendance is considered, the result is statistically significant at the three percent level. When the situation of a female child with a mother who has not attended school is considered,

the child is half as likely to attend school as other children. Once again the social class of the parent is imperative to valuing education, especially for girls.

The mean total cost of schooling in the area did not have an impact on the probability that a child would attend school. As the cost of schooling increased, the child was no less likely to attend school. Preliminary tests on different ways to account for school expenditure were insignificant or had no effect also. At this point in time there is no way to draw a statistical connection between school fees and school enrollment. Therefore, it appears that schooling is something that is predicted by social class, and not economic class.

In conclusion, we can see that the sex of the child, and the interaction between the mother's school attendance and the sex of the child are good predictors of the probability that a child will attend school. From the model we cannot ascertain that the cost of schooling will increase or decrease the probability of a child attending school. The model indicates that children in rural areas are more likely to attend school than their counterparts in urban areas. The overall fit of the model is good.

Summary of Results

All three models were consistent in that the gender of the child and the school attendance of the mother were the most important predictors of school enrollment status. Gender of the child was significant in all three models. Girls were 1.5 times as likely to drop out of school and 3 times as likely to never attend school. Boys were more likely to attend school than girls.

The school attendance record of the mother was significant for those who never attended school. Uneducated mothers were three times as likely to have children who did not attend school.

The interaction between the educational background of the mother and gender of the child was an important factor in two of the models. For girl students who dropped out of school and those attending, their mother's school record was important. Girl children of non-attending mothers were 1.8 times as likely to drop out and half as likely to attend.

Contrary to the initial hypothesis, the mean cost of schooling had no measurable effect on school enrollment status in any of the models. The square of the cost of schooling also had no effect on the odds of a student dropping out, attending, or not attending school.

VI. Conclusion

The results of the model present a strong case for the importance of considering gender in analyses of public policy and investment. Education of mothers and sex of the child were significant factors in the household's decision to enroll a child in school. The gender disparity found in school enrollment patterns is a reality that policy analysts must face. Investing in education means also investing in girls' education.

The empirical results in this study are most disturbing, not in the enrollment levels themselves, but the gender disparity found in those enrollment levels. Gender, as an intervening variable in economic and education decisions, has a profound effect

on the overall education health of the country. Female children are 1.65 times as likely to drop out of school and over three times as likely to never attend school. In order to address the goal of universal primary enrollment, and an educated populace in general, the issue of girl's education needs to be addressed.

Program and Policy Implications

Various policy groups are already calling for further investment in girls' education. Supporting the statistics of the models presented here, which shows that females are half as likely to stay in school, "Women's Eyes on the World Bank (WEWB)" suggests that direct investment in educational programs for girls needs to be increased. Specifically, they would target primary and secondary education, as well as programs to help girls stay in school. In addition to primary and secondary education, WEWB would invest in literacy programs for adult women to increase women's participation in the market economy. This supposition is supported by the data which suggests that mothers who attend school are much more likely to send their daughters to school. This in fact is one of the leading determinants of school enrollment for girl children. Therefore, a program that supports literacy for adult women does more than help those individual women; it helps their children as well.

In 1999, the World Bank loaned the Ghanaian government money to fund the National Functional Literacy Project. The aim of the project is to increase the number of literate Ghanaians from age 15-45 years, with a focus on women and the poor. If this project specifically targets women, it will have a ripple effect into the society as a whole by increasing not only literacy, but also overall school enrollment.

The cost recovery program, as implemented in 1989, was apparently not a barrier to educational enrollment, but a drastic increase in school fees presumably would prohibit many children from attending school. Despite the fact that the hypothesis about school fees was not supported by the estimated models, the actual determinants of school enrollment found by the model are important to policy decisions around school enrollment. The model suggests that girls have a much harder time enrolling in school, and subsequently staying in school. Therefore, programs instituted by the Ghanaian government or other NGO's should have a gendered approach to increasing enrollment. Beyond targeting girls specifically programs should be aimed at the mothers who influence the enrollment of their girl children. A program that focused on educating mothers would in the long run have a positive impact on the enrollment level of girls.

The results suggest that achieving total universal female enrollment levels will take some time due to the intergenerational effects. The percentage of girls not attending school (27%) is much smaller than the percentage of mothers who have not attended school (68%). If the model is correct in stating that daughters of mothers who have not attended school are half as likely to go to school, then with each generation, girls' school enrollment will increase. If we hold the group of females going to school currently (73%) constant as school attenders for subsequent generations, then we can see how school attendance improves among those not attending school with each subsequent generation. If 27% of daughters have not attended school and their daughters are half as likely to go to school, then 9% of their daughters will go to school in the next generation, and 18% will not. The next generation will see 6% go to school, and 12% not go to school. With each generation,

the percentage not going to school will decrease by 1/3. In approximately eight generations, the number not going to school will be close to zero, thereby creating universal school enrollment. This of course assumes no change in policy over time, and holds all other variables constant. Since eight generations is approximately 120 years, there is a clear case to be made for further interventions in the short run, such as adult literacy programs aimed at mothers.

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Table 1: Definition of Variables Used in Econometric Analysis

Variable Definition	Variable Abbreviation
Dependent Variables	
Dropped Out of School (Dropped Out = 1)	DROP
Attending School Presently (Attending = 1)	ATEDING
Never Attended School (Never Attended = 1)	NEV
Explanatory Variables	
Age in Years	AGEY
Sex of Child (Female = 1)	FEMALE
Location of Household (Rural =1)	RURAL
Mother's School Attendance (Mother Has Not Attended School =1)	MNOTATT
Interaction Term between Mother's School Attendance and Sex of Child (FEMALE x MNOTATT)	FEMMNOTATT
Centered Mean School Expenditure	CMTEXP
Centered Mean School Expenditure Squared	CMTEXPSQ

Table 2: Results of the Dropout Variable

Model Results for School Dropouts: Dependent Variable = DROP				
Independent Variables	**Parameter Estimate**	**Standard Error**	**Significance Level**	**Exp (Est)**
Intercept	-6.730	0.3595	<.0001	0.0020
AGEY	0.376	0.0204	<.0001	1.4570
FEMALE	0.426	0.2270	0.0606	1.5310
RURAL	-0.350	0.1648	0.0338	0.7050
MNOTATT	*-0.185*	*0.1982*	*0.3507*	*0.8310*
FEM MNOTATT	0.626	0.2773	0.0240	1.8700
CMTEXP	-0.00007	0.000031	0.0185	1.0000
CMTEXPSQ	*3.48E-09*	*1.975E-09*	*0.0780*	*1.0000*
Tests of the Model				
	Likelihood Ratio	582.811	**<.0001**	
	Wald	365.920	**<.0001**	
	Pearson	1854.534	**<.0001**	
	% Concordant	**84.000**		

Table 3: Results for the Never Attended Variable

Model Results for Never Attended School: Dependent Variable = NEV				
Independent Variables	**Parameter Estimate**	**Standard Error**	**Significance Level**	**Exp (Est)**
Intercept	-2.187	0.294	<.0001	0.112
AGEY	-0.051	0.013	<.0001	0.951
FEMALE	0.726	0.291	0.013	2.066
RURAL	*-0.196*	*0.154*	*0.204*	*0.822*
MNOTATT	1.124	0.256	<.0001	3.077
FEM MNOTATT	*0.497*	*0.316*	*0.116*	*1.644*
CMTEXP	-0.0003	0.000026	<.0001	1.000
CMTEXPSQ	1.583E-08	1.726E-09	<.0001	1.000
Tests of the Model				
	Likelihood Ratio	479.801	**<.0001**	
	Wald	348.791	**<.0001**	
	Pearson	2028.107	**<.0001**	
	Percent Concordant	**78.700**		

Table 4: Results of the Attending Presently Variable

Model Results for School Attenders: Dependent Variable = ATEDING				
Independent Variables	**Parameter Estimate**	**Standard Error**	**Significance Level**	**Exp (Est)**
Intercept	0.62038	0.3535	<.0001	494.63
AGEY	-0.3722	0.0202	<.0001	0.689
FEMALE	-0.486	0.2253	0.031	0.615
RURAL	0.5082	0.164	0.0019	1.662
MNOTATT	*0.1712*	*0.1979*	*0.3869*	*1.187*
FEM MNOTATT	-0.5947	0.2755	0.0309	0.552
CMTEXP	0.000093	0.00003	0.0023	1.00
CMTEXPSQ	*-4.11E-09*	*1.97E-09*	*0.0372*	*1.00*
Tests of the Model				
	Likelihood Ratio	589.47000	**<.0001**	
	Wald	369.33000	**<.0001**	
	Pearson	1866.78120	**<.0001**	
	Percent Concordant	**84.00000**		

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